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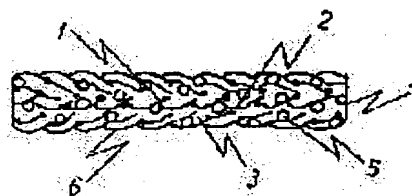
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## (54) SHEET-LIKE EXOTHERMIC ELEMENT

## (57)Abstract:

**PURPOSE:** To provide the sheet-like exothermic element having a high exothermic temp., long duration time, small thickness and high resilience by holding an exothermic compsn. which generates heat by coming into contact with air on a sheet-like substrate having many gaps and using a non-woven fabric blended with highly water-absorptive fibers having high water absorbability as the substrate.

**CONSTITUTION:** The exothermic compsn. 5 essentially composed of iron is admitted into the substrate 4 consisting of the non-woven fabric formed by blending the highly water-absorptive fibers 1 with other fibers 2 and having the many gaps 3 and is held therein in the state of entering the gaps 3. An inorg. electrolyte which is one component of the exothermic compsn is adsorbed in the form of an aq. soln. on the highly water-absorptive fibers 1 of the substrate 4 and is held in this state by these fibers and then, the sheet-like structure 6 is formed. The non-woven fabric formed by blending the highly water-absorptive fibers having  $\geq 50\text{ml/g}$  water absorbability is used as the substrate 4. Both surfaces of the substrate 4 held with the exothermic compsn. 5 are coated with coating materials having air permeability and these coating materials are thermally fused under pressurization.



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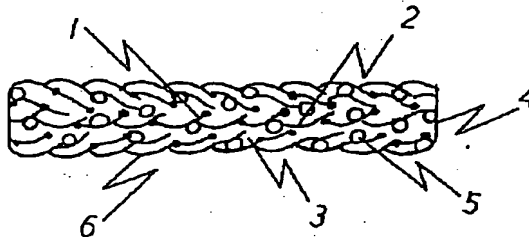
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(54) 【発明の名称】 シート状発熱体

(57) 【要約】

【目的】 空気と接触することにより発熱する発熱組成物を用いた発熱体であって、発熱組成物の片寄りがなく、薄型で柔軟性を有し、しかも、発熱特性が優れたシート状発熱体を得る。

【構成】 支持体として高吸水性繊維が混紡され、多数の空隙を有する不織布を用い、その空隙に発熱組成物を保持せしめる。



## 【特許請求の範囲】

【請求項1】 多数の空隙を有するシート状の支持体に、被酸化性金属粉を主成分とし、空気と接触して発熱する発熱組成物を保持せしめてなるシート状発熱体において、支持体として吸水能が50ml/g以上の高吸水性繊維が混紡されてなる不織布を用いることを特徴とするシート状発熱体。

【請求項2】 発熱組成物が保持された支持体の両面が通気性を有する被覆材によって被覆され、加圧下に熱融着された請求項1に記載のシート状発熱体。

【請求項3】 高吸水性繊維がアクリル系繊維のアルカリ加水分解によって得られるアクリル酸系の繊維である請求項1に記載のシート状発熱体。

【請求項4】 不織布の厚さが2~15mm、坪量が20~120g/m<sup>2</sup>で高吸水性繊維の混紡率が20%以上である請求項1に記載のシート状発熱体。

【請求項5】 不織布が高吸水性繊維とポリエチレン、ポリプロピレン、ナイロン、アクリル、ポリエステル、ポリビニルアルコール、ポリウレタンから選ばれる繊維の1種または2種以上との混紡品である請求項1に記載のシート状発熱体。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明はシート状発熱体に関し、さらに詳細には発熱組成物の移動、片寄りがなく、薄型で柔軟性を有するシート状発熱体に関する。

【0002】採暖手段の一つとして鉄粉などの被酸化性金属を主成分とし、空気と接触して発熱する発熱組成物が通気性を有する袋に収納された発熱体がかいるなどとして広く利用されている。しかしながら、これらの発熱体は使用が簡単であるという利点はあるが、人体に装着した場合などには、運動時のみならず、静止状態においても発熱組成物が重力で袋の下方に片寄り、形状変化による違和感を生ずる他、発熱特性自体も変化して性能が低下するという問題点がある。これらの欠点を改善するための手段の一つとして、発熱組成物を支持体などに保持または挟持させてシート状とするための種々の試みがなされている。

## 【0003】

【従来の技術】例えば、①発熱組成物を、金網、プラスチックなどの網状物に保持させる方法（特開昭53-84246号公報）、②活性炭繊維などに塩化物、水など酸化助剤を含浸させたものにアルミ箔などの金属箔を重ね合わせる方法（特開昭63-37181号公報）、③酸化助剤を含浸させた和紙の上に発熱剤を散布した後、これを加圧してシート状に成型する方法（実開昭64-42018号公報）、④植物系繊維を含む熱融着繊維製不織布を複数枚重ね合わせ、その領域に化学発熱剤を分散させる方法（特開平2-142561号公報）などがある。

## 【0004】

【発明が解決しようとする課題】しかしながら、これらにはシート状発熱体としてそれぞれ次のような問題点がある。

①金網、プラスチックなどの網状物に保持させた場合には、シート状になったとしても剛性が大きくなり、実用的な柔らかさが得られず、しかも、発熱組成物の粉末が離脱し易い。

②酸化助剤を含浸させた活性炭繊維などとアルミ箔などの金属箔を重ね合わせたものは粉末に比べて金属の表面積が著しく小さいため、優れた発熱性能が得られず、また、枚数を増やすと厚みが増し、柔軟性が無くなる。

③また、紙の上に発熱剤を散布、加圧してシート状としたものは、折り曲げや振動などによって発熱剤が容易に剥がれるため、実用的でない。

④さらに、不織布を複数枚重ね合わせ、その領域に化学発熱剤を分散させたものは植物系繊維が混合されているとはいえ、例えば吸水能の高いバルブ自体でもせいぜい20ml/gが限度であり、この程度では保水能力が十分でなく、発熱持続時間を高めるために結局はパーミキュライトや高分子吸収剤などの保水剤を併用することになり、全体の厚みが増すという問題点がある。

このように従来技術にはそれぞれ固有の欠点があるため、未だ実用的に満足とされるシート状発熱体は得られていない。

## 【0005】

【課題を解決するための手段】本発明者らは、これらの課題を解決し、発熱組成物が確実に保持されて移動することがなく、厚みが薄く柔軟で、しかも、優れた発熱性能を有するシート状発熱体を得るべく研究を重ねた結果、吸水性繊維を含む不織布を用いることにより目的を達成しうることを見出し、本発明に到達した。すなわち本発明は、多数の空隙を有するシート状の支持体に、被酸化性金属粉を主成分とし、空気と接触して発熱する発熱組成物を保持せしめてなるシート状発熱体において、支持体として吸水能が50ml/g以上の高吸水性繊維が混紡されてなる不織布を用いることを特徴とするシート状発熱体である。

【0006】本発明において、発熱組成物の支持体となる不織布に混紡される高吸水性繊維は50ml/g以上、好ましくは100ml/g以上の吸水能を有するものである。一般的にはアルカリによる加水分解によって生ずる親水基および架橋構造などを有するアクリル系繊維が好ましく、例えば、ポリアクリル酸塩の架橋物、アクリル酸塩-アクリル酸エステル共重合体、ポリアクリロニトリル架橋物の加水分解物、アクリル酸塩-アクリルアミド共重合体、ポリビニルアルコール-アクリル酸塩共重合体などの繊維であり、その太さが1~10デニール、繊維長が10~100mm程度のものである。

【0007】支持体となる不織布は上記のような高吸水

性繊維単独からなるものであってもよいが、強度面などから、通常は、その他の繊維との混紡されたものが用いられる。高吸水性繊維と混紡される繊維の種類には特に制限はなく、ポリエチレン、ポリプロピレン、ナイロン、アクリル、ポリエステル、ポリビニルアルコール、ポリウレタンなどの合成繊維、綿、バルブ、ビスコースレーヨンなどの天然繊維などであるが、得られた発熱体の両面をさらにフィルムや不織布などで被覆するような場合には熱融着性が優れている点などからポリエチレン、ポリプロピレン、ナイロン、アクリル、ポリエステルなどの合成樹脂繊維が好ましい。

【0008】不織布全体に対する高吸水性繊維の混紡率は、通常は20wt%以上、好ましくは30～80wt%程度とされる。支持体となる不織布への加工は乾式法、湿式法のいずれによるものであってもよく、その厚さとしては、通常は、2～15mm、好ましくは3～12mmであり、1m<sup>2</sup>当たりの重量は20～120g、好ましくは30～100g程度のものである。

【0009】本発明において、支持体となる不織布の空隙に保持せしめられる発熱組成物は被酸化性金属粉、活性炭、無機電解質、水などの混合物である。金属粉としては鉄粉、アルミニウム粉などであるが、通常は鉄粉が用いられ、還元鉄粉、霧吹鉄粉、電解鉄粉などである。無機電解質としては、アルカリ金属、アルカリ土類金属、重金属の塩化物などが好ましく、例えば、NaCl、KCl、CaCl<sub>2</sub>、MgCl<sub>2</sub>、FeCl<sub>3</sub>などが用いられる。活性炭は反応助剤および保水剤として使用され、通常は椰子殻炭、木粉炭などである。発熱組成物の配合割合は支持体となる不織布の性状、目的とする発熱性能などによって異なり一概に特定はできないが、例えば金属粉が100重量部に対し、活性炭が5～20重量部、無機電解質が1.5～10重量部、水が25～60重量部である。その他、所望により、さらにパーライト、パーミキュライト、吸水性樹脂などの保水剤や水素発生抑制剤、固結防止剤などを混合することもできる。

【0010】発熱組成物を支持体である不織布に保持させる方法としては例えば、①鉄粉、活性炭、無機電解質、水などを混合した状態のものを支持体の上に広げて振動を与えるか押しつけるなどで保持させてもよく、また、②鉄粉、活性炭、無機電解質など粉末原料の混合物を支持体の上に広げて振動を与えて内部の空隙に進入させて保持させた後、これに水を撒布してもよく、あるいは、③鉄粉、活性炭など無機電解質を除く粉末原料の混合物を支持体の上に広げて振動を与えて内部の空隙に進入させて保持させた後、これに食塩など無機電解質水溶液を撒布して含浸させてもよい。これらのうちでも水分を含まない状態の方が支持体内部の空隙に進入し易い点で②および③が好ましく、さらには、無機電解質を全体に均一に浸透させる点などから③の方法が特に好まし

い。

【0011】支持体の不織布に対する発熱組成物の保持量は、不織布の厚さ（目的とする発熱体の厚さ）、発熱性能などに応じて定められるが、通常は不織布1m<sup>2</sup>当たり500～10000g、好ましくは1000～5000gである。保持量が500gよりも少ないと発熱温度、発熱持続時間が低下し、一方、保持量が10000gよりも多くなると発熱体の厚みが増し、薄型で柔軟なシートの形成が困難となる。

【0012】本発明において、発熱組成物を支持体の不織布に保持せしめたものをそのままの状態ですべてを熱圧着することにより、シート状発熱体として用いてもよいが、加工時および使用時を含めて発熱組成物の離脱を確実に防止する目的などから、その両面にさらに不織布や通気性フィルムを重ね合わせて被覆することが好ましい。被覆材の材質としては、発熱組成物の発熱に必要な量の空気を供給しうるものであり、合成繊維、天然繊維の不織布、交織布、紙、各種合成樹脂フィルムおよびこれらの複合シートなどを用いることができる。例えば、ポリエチレン、ポリプロピレン、ナイロン、ポリアクリル、ポリエステル、ポリ塩化ビニルなどの合成繊維、綿、バルブ、麻、毛、レーヨンなどの天然繊維の単独または混紡不織布、交織布、紙など、また、合成樹脂フィルムでは例えば、ポリエチレン、ポリプロピレン、ナイロン、ポリエステル、ポリ塩化ビニルなどのフィルムに針、レーザーなどで細孔を設けて通気性を持たせたもの、あるいは、元来多数の微細孔を有する延伸微多孔質フィルムなどのほか、前記の支持体と同材質の不織布も使用できる。これらは単独で、または適宜組み合わせで使用されるが、被覆加工性の面からは支持体と接する側には融点の低い繊維またはフィルムを、他の側には非溶解性乃至は融点の高い繊維またはフィルムを配した被覆材などが好ましい。

【0013】本発明において、被覆をおこなう場合には熱融着の過程で所定の厚さのシート状に加工される。被覆の方法としては支持体の表面に被覆材を重ね合わせ、熱ロールを通すか、またはプレス機により熱圧着するか、あるいは、被覆材を用いた扁平状の袋内に収納した状態で圧縮しながら熱融着することによっておこなわれる。これによって支持体が圧縮された状態で固着され、薄型のシート状になると同時に発熱組成物がより強固に保持される。シート状とされた発熱体の厚さは、目的とする発熱性能、用途などによって選択されるが、シート状としての特性を活用できるよう、なるべく薄くなるように設計され、通常は6mm以下、好ましくは4mm以下である。

【0014】次に、本発明を図面によって例示し、さらに具体的に説明する。図1は発熱組成物が保持されたシート状構造体の断面図であり、図2は図1の構造体の両面が通気性の被覆材で被覆されたシート状発熱体の断面

図である。図1において、高吸水性繊維1がその他の繊維2と混紡され、多数の空隙3を有する不織布からなる支持体4の内部に鉄粉を主成分とする発熱組成物5が導入せしめられ、空隙3に入った状態で保持されている。発熱組成物の1成分である無機電解質は水溶液の状態でその大部分は支持体中の高吸水性繊維1に吸着された状態で保持（図には示されていない）され、シート状の構造体6を形成している。

【0015】図2において、図1の構造体6の両面に、不織布製の被覆材7、7がそれぞれ重ね合わされて熱ロールなどを通すことにより、両面から圧縮された状態で互いに熱融着され、本発明のシート状発熱体8を構成している。これらのシート状発熱体はさらに非通気性の外袋内に密封収納するか、あるいは通気面全体に非通気性のフィルムを貼りつけるなどで、外気と遮断した状態で保存される。シート状発熱体の使用時には、上記の外気との遮断を取り除くことによって発熱が始まり、人体の採暖、患部の加温などに用いられる。

【0016】本発明において、被覆材の外面に非接着性の粘着剤を塗布することもでき、それによって得られたシート発熱体を肌着、あるいは関節など任意の部位に装着することが可能となる。シート状発熱体の形状、大きさには特に制限はなく、長方形、正方形、円形、星型など任意の形状とすることができ、また、一般に市販されている従来の発熱体相当の大きさは勿論、例えば、1m平方のような大きさとすることもできる他、任意の形状、大きさに切り取って使用することも可能である。

【0017】

【実施例】

実施例1

支持体としてアクリル繊維を高濃度アルカリで加水分解させた架橋構造を有する高吸水性繊維で吸水能が130ml/gの高吸水性繊維（東洋紡（株）製、ランシールF）とメルティ（ユニチカ（株）製、ポリプロピレン・ポリエチレン繊維）とを50wt%：50wt%の比率で混紡した厚さ7mm、坪量70g/m<sup>2</sup>の不織布を用いた。この不織布を70mm×120mmに切り取り、この上に鉄粉30g、活性炭4gの混合粉末を均一に広げた後、パイプレータで振動をかけることにより、支持体内部の空隙に保持させた。引き続き、塩化ナトリウムの8%水溶液9gを撒布したところ、裏側にはほとんど抜けることなく支持体である不織布に十分に保持された。

【0018】次に、支持体の両面に被覆材として支持体と同形状のティッシュペーパー（パルプ）をを重ね合わせて熱ロールを通すことにより、互いに熱圧着してシート状とした。さらに、このものを片面が透湿度400g/m<sup>2</sup>・dayのポリプロピレン製の微多孔フィルム、他

面がポリエチレンフィルムとナイロン不織布のラミネートシートで構成された偏平状の内袋に収納してシート状発熱体とした。このものの厚さを測定した結果、3mmであった。この状態で非通気性の外袋内に密封収納した。

【0019】2日後に、シート状発熱体を外袋から取り出して室温20℃、相対湿度65%の室内で、JIS S-4100の発熱試験法に基づいて発熱性能の測定をおこなった。その結果、図3に示したような発熱曲線が得られた。すなわち、15分で40℃を超え、70分後には約60℃に達した。そして40℃以上の発熱持続時間は約10時間であり、この間常に柔軟なシート状が維持された。

【0020】比較例1

支持体として高吸水性繊維を混紡する代わりに、メルティに綿繊維を50wt%：50wt%で混紡した不織布を用いた他は、実施例1におけると同様にしてシート状発熱体を製作した。このシート状発熱体を実施例1におけると同じ条件で発熱性能の測定をおこなった結果、図3に示したような発熱曲線であった。すなわち、40℃に達するまで約30分を要し、60分後に55℃に達したがそれ以上の温度上昇は見られなかった。そして40℃以上の発熱持続時間は約6時間であった。

【0021】

【発明の効果】本発明は、高吸水性繊維を用いた不織布を発熱組成物の支持体としたものであり、それによって発熱温度が高く、持続時間が長いなど優れた発熱性能を有するとともに薄型で柔軟性の大きいシート状発熱体の製造が可能となった。従って、採暖用、患部の加温用などとして人体の任意の部位にフィットした状態で装着することができ、長時間にわたって効果が維持されるようになった。

【0022】

【図面の簡単な説明】

【図1】 発熱組成物が保持された支持体の断面図。

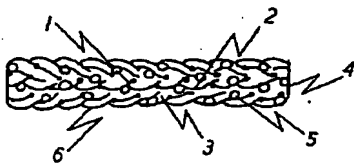
【図2】 シート状発熱体の断面図。

【図3】 発熱曲線図。

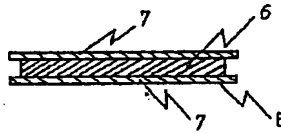
【符号の説明】

- 1 高吸水性繊維
- 2 その他の繊維
- 3 空隙
- 4 支持体
- 5 発熱組成物
- 6 構造体
- 7 被覆材
- 8 シート状発熱体

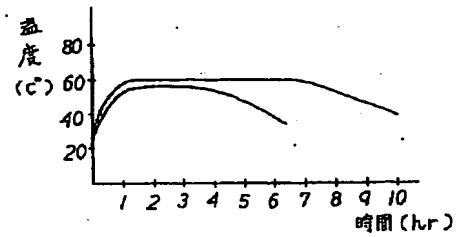
【図1】



【図2】



【図3】



フロントページの続き

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CLAIMS

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[Claim(s)]

[Claim 1] The sheet-like heating element with which an oxidizability metal powder is used as a principal component at the base material of the shape of a sheet which has many openings, and water absorption power is characterized by using the nonwoven fabric with which it comes to mix the high absorptivity fiber of 50 or more ml/g as a base material in the sheet-like heating element which makes it come to hold the exoergic constituent which contacts air and generates heat.

[Claim 2] The sheet-like heating element according to claim 1 with which both sides of the base material with which the exoergic constituent was held were covered with the covering material which has permeability, and thermal melting arrival was carried out to the bottom of application of pressure.

[Claim 3] The sheet-like heating element according to claim 1 which is fiber of the acrylic-acid system from which high absorptivity fiber is obtained by alkali hydrolysis of an acrylic fiber.

[Claim 4] The sheet-like heating element according to claim 1 whose blending ratio of high water absorption fiber 2-15mm and basis weight is 20% or more in 20 - 120 g/m<sup>2</sup> for the thickness of a nonwoven fabric.

[Claim 5] The sheet-like heating element according to claim 1 which are one sort of the fiber as which a nonwoven fabric is chosen from high absorptivity fiber, polyethylene, polypropylene, nylon, an acrylic, polyester, polyvinyl alcohol, and polyurethane, or two sorts or more of mixed elegance.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** About a sheet-like heating element, migration of an exoergic constituent and deviation are not in a detail further, and this invention relates to the sheet-like heating element which has flexibility with a thin shape.

**[0002]** use oxidizability metals, such as iron powder, as a principal component as one of the warming means, and the heating element with which the exoergic constituent which contacts air and generates heat was contained by the bag which has permeability should be -- it is widely used as \*\*\*\*. However, although there is an advantage that these heating elements are easy to use it, when the body is equipped, also not only in the time of motion but in a quiescent state, an exoergic constituent produces deviation and the sense of incongruity by configuration change in a lower part in a bag by gravity, and also there is a trouble that the heat generation characteristic itself changes and the engine performance falls. The various attempts for making a base material etc. hold or pinch an exoergic constituent, and considering as the shape of a sheet as one of the means for improving these faults, are made.

**[0003]**

**[Description of the Prior Art]** For example, the method of making \*\* exoergic constituent hold to cancellous objects, such as a wire gauze and plastics, (JP,53-84246,A), \*\* How (JP,63-37181,A) to lay metallic foils, such as aluminum foil, on top of what carried out impregnation of the oxidation assistants, such as a chloride and water, to activated carbon fiber etc., \*\* How to pressurize this and cast in the shape of a sheet, after sprinkling an exothermic agent on the Japanese paper to which impregnation of the oxidation assistant was carried out (JP,64-42018,U), \*\* There is a method (JP,2-142561,A) of making two or more sheet superposition and its field distribute a chemistry exothermic agent etc. about the nonwoven fabric made from thermal melting arrival fiber containing vegetable system fiber.

**[0004]**

**[Problem(s) to be Solved by the Invention]** However, there are the troubles respectively following as a sheet-like heating element in these.

\*\* When it is made to hold to cancellous objects, such as a wire gauze and plastics, even if it becomes sheet-like, rigidity becomes large, practical softness is not obtained, but, moreover, the powder of an exoergic constituent tends to break away.

\*\* Since metaled surface area is remarkable and small compared with powder, if the outstanding febrile ability is not obtained and number of sheets is increased, the increase of thickness and the flexibility of what piled up the activated carbon fiber etc. and metallic foils, such as aluminum foil, to which impregnation of the oxidation assistant was carried out will be lost.

\*\* Since an exothermic agent separates easily by bending, oscillation, etc., what sprinkled the exothermic agent, pressurized on paper and was made into the shape of a sheet again is not practical.

\*\* although , as for the thing which made two or more sheets superposition and its field distribute a chemistry exothermic agent , vegetable system fiber be further mix in the nonwoven fabric -- pulp with water absorption power high , for example itself -- at most -- 20 ml/g -- a

limit -- it be -- to this extent -- come out -- water retention capacity be enough , and in order to raise the exoergic persistence time , water retention agents , such as a vermiculite and a macromolecule absorbent , will be use together after all , and there be a trouble that the whole thickness increase .

Thus, since the conventional technique has the fault of a proper, respectively, the sheet-like heating element still considered as satisfaction practical is not obtained.

[0005]

[Means for Solving the Problem] As a result of repeating research in order solve these technical problems, and an exoergic constituent is held certainly, and does not move, and thickness is thinly flexible and to obtain the sheet-like heating element which moreover has the outstanding febrile ability, by using the nonwoven fabric containing absorptivity fiber, this invention persons found out that the object could be attained and reached this invention. That is, this invention is a sheet-like heating element with which an oxidizability metal powder is used as a principal component at the base material of the shape of a sheet which has many openings, and water absorption power is characterized by using the nonwoven fabric with which it comes to mix the high absorptivity fiber of 50 or more ml/g as a base material in the sheet-like heating element which makes it come to hold the exoergic constituent which contacts air and generates heat.

[0006] In this invention, the high absorptivity fiber mixed by the nonwoven fabric used as the base material of an exoergic constituent has preferably 50ml /or more of water absorption power of 100 or more ml/gg. The acrylic fiber which has a hydrophilic group, the structure of cross linkage, etc. which are generally produced by hydrolysis by alkali is desirable, for example, are fiber, such as hydrolyzate of the bridge formation object of polyacrylate, an acrylate-acrylic ester copolymer, and a polyacrylonitrile bridge formation object, an acrylate-acrylamide copolymer, and a polyvinyl alcohol-acrylate copolymer, the size is 1-10 deniers, and fiber length is about 10-100mm.

[0007] Although the nonwoven fabric used as a base material consists of the above high absorptivity fiber independent, the mixed thing with other fiber is usually used from a side on the strength etc. Although there is especially no limit in the class of high absorptivity fiber and fiber mixed and it is natural fibers, such as synthetic fibers, such as polyethylene, polypropylene, nylon, an acrylic, polyester, polyvinyl alcohol, and polyurethane, cotton, pulp, and viscose rayon, etc., when covering both sides of the obtained heating element with a film, a nonwoven fabric, etc. further, plastic fiber, such as polyethylene, polypropylene, nylon, an acrylic, and polyester, is desirable from the point that thermal melting arrival nature is excellent etc.

[0008] the blending ratio of the high absorptivity fiber to the whole nonwoven fabric -- usually -- more than 20wt% -- it may be about 30-80wt% preferably. It may be based on any of dry process and a wet method, and is usually 3-12mm preferably 2-15mm as the thickness, and processing to the nonwoven fabric used as a base material is 2 1m. 20-120g of weight of a hit is an about [ 30-100g ] thing preferably.

[0009] In this invention, the exoergic constituents you are made to hold by the opening of the nonwoven fabric used as a base material are mixture, such as an oxidizability metal powder, activated carbon, an inorganic electrolyte, and water. Although it is iron powder, aluminium powder, etc. as a metal powder, iron powder is usually used and they are reduced iron powder, sprayer iron powder, electrolytic iron powder, etc. As an inorganic electrolyte, the chloride of alkali metal, alkaline earth metal, and heavy metal etc. is desirable, for example, NaCl, KCl and CaCl<sub>2</sub>, MgCl<sub>2</sub>, FeCl<sub>3</sub>, etc. are used. Activated carbon is used as a reaction assistant and a water retention agent, and is usually coconut shell charcoal, wood flour charcoal, etc. Although the blending ratio of coal of an exoergic constituent changes with febrile ability made into the description of the nonwoven fabric used as a base material, and the object and specification is impossible generally, for activated carbon, 5 - 20 weight section and an inorganic electrolyte are [ a metal powder / 1.5 - 10 weight section and water ] 25 - 60 weight sections to the 100 weight sections, for example. In addition, water retention agents, such as a pearlite, a vermiculite, and absorptivity resin, a hydrogen generating inhibitor, a joint inhibitor, etc. are also further mixable with a request.

[0010] As an approach of making an exoergic constituent holding to the nonwoven fabric which

is a base material, for example \*\* You may make it hold by forcing whether the thing in the condition of having mixed iron powder, activated carbon, an inorganic electrolyte, water, etc. is extended on a base material, and an oscillation is given etc. Moreover, after opening the mixture of powder raw materials, such as \*\* iron powder, activated carbon, and an inorganic electrolyte, on a base material, giving an oscillation, making it advance into an internal opening and making it hold, water may be sprinkled to this. Or after opening the mixture of the powder raw material except inorganic electrolytes, such as \*\* iron powder and activated carbon, on a base material, giving an oscillation, making it advance into an internal opening and making it hold, impregnation of the inorganic electrolyte water solutions, such as salt, may be sprinkled and carried out to this. \*\* and \*\* are desirable at the point that the direction of the condition that moisture is not included among these tends to advance into the opening inside a base material, and especially the approach of \*\* is desirable from the point of making the whole permeating homogeneity and selling an inorganic electrolyte to it further etc.

[0011] The amount of maintenance of the exoergic constituent to the nonwoven fabric of a base material is usually 2 1m of nonwoven fabrics, although set according to the thickness (thickness of the target heating element) of a nonwoven fabric, febrile ability, etc. They are 1000-5000g preferably 500-10000g of hits. If there are few amounts of maintenance than 500g, exoergic temperature and the exoergic persistence time will fall, and on the other hand, if the amount of maintenance increases more than 10000g, it will become difficult increase and to form [ of a sheet flexible at a thin shape ] the thickness of a heating element.

[0012] In this invention, although the thing which made the exoergic constituent hold to the nonwoven fabric of a base material may be used as a sheet-like heating element by carrying out thermocompression bonding of the whole in the condition as it is, it is desirable to pile up and cover a nonwoven fabric and a breathable film further to the both sides from the object which prevents certainly balking of an exoergic constituent including the time of processing and an activity. As construction material of covering material, the air of a complement can be supplied to generation of heat of an exoergic constituent, and the nonwoven fabric of a synthetic fiber and a natural fiber, a union cloth, paper, various synthetic-resin films, these compound sheets, etc. can be used. For example, polyethylene, polypropylene, nylon, the poly acrylic, With synthetic-resin films of natural fibers, such as synthetic fibers, such as polyester and a polyvinyl chloride, cotton, pulp, hemp, hair, and rayon, such as independent or a mixed nonwoven fabric, a union cloth, and paper, for example What prepared pore in films, such as polyethylene, polypropylene, nylon, polyester, and a polyvinyl chloride, by the needle, laser, etc., and gave permeability to them, Or the aforementioned base material besides being the drawing fine porosity film which has much micropores originally, and the nonwoven fabric of this construction material can also be used. Although these are independent, or it is used, combining suitably, the covering material which arranged other fiber or films with unmelting nature or the melting point high to a side for fiber or a film with the low melting point on the side which touches a base material from the field of coating nature is desirable.

[0013] In this invention, when covering, it is processed in the shape of [ of thickness predetermined in the process of thermal melting arrival ] a sheet. It is carried out by carrying out thermal melting arrival, compressing in the condition of having carried out thermocompression bonding of the covering material with the press machine through superposition and a hot calender roll on the surface of the base material as the approach of a coat, or having contained in the flat-like bag using covering material. While fixing where a base material is compressed, and becoming the shape of a thin sheet by this, an exoergic constituent is held more firmly. Although the thickness of the heating element made into the shape of a sheet is chosen by febrile ability, an application, etc. which are made into the object, it is designed so that it may become as thin as possible, and is usually 4mm or less preferably 6mm or less so that the property as the shape of a sheet can be utilized.

[0014] Next, this invention is illustrated with a drawing and explained still more concretely. Drawing 1 is the sectional view of the sheet-like structure where the exoergic constituent was held, and drawing 2 is the sectional view of the sheet-like heating element by which both sides of the structure of drawing 1 were covered with the covering material of permeability. In drawing

1, high absorptivity fiber 1 is mixed with other fiber 2, and the exoergic constituent 5 which uses iron powder as a principal component is made to advance by the interior of the base material 4 which consists of a nonwoven fabric which has many openings 3, and it is held in the condition of having gone into the opening 3. In the state of a water solution, the most is held where the high absorptivity fiber 1 in a base material is adsorbed (not shown in drawing), and the inorganic electrolyte which is one component of an exoergic constituent forms the sheet-like structure 6. [0015] In drawing 2, when the covering material 7 and 7 made of a nonwoven fabric puts on both sides of the structure 6 of drawing 1, respectively and lets a hot calender roll etc. pass to them, thermal melting arrival is mutually carried out in the condition of having been compressed from both sides, and the sheet-like heating element 8 of this invention is constituted. These sheet-like heating elements carry out seal receipt into a bag outside non-permeability further, or are sticking the film of non-permeability on the whole aeration side etc., and are saved in the condition of having intercepted with the open air. By removing cutoff with the above-mentioned open air at the time of the activity of a sheet-like heating element, generation of heat starts and it is used for warming of the body, warming of the affected part, etc.

[0016] In this invention, the binder of un-installing nature can also be applied to the outside surface of covering material, and it becomes possible to equip the part of arbitration, such as an underwear or a joint, with the sheet heating element obtained by it. Of course, the conventional magnitude of a heating element which especially a limit does not have in the configuration of a sheet-like heating element and magnitude, and can make a rectangle, a square, circular, a star type, etc. the configuration of arbitration, and is generally marketed can also be made into magnitude like 1m square, and also it can be cut off and used for the configuration of arbitration, and magnitude.

[0017]

[Example]

7mm in thickness and basis weight 70 g/m<sup>2</sup> with which water absorption power mixed the high absorptivity fiber (the Toyobo Co., Ltd. make, the run seal F) and the mel tee (the Unitika, Ltd. make, polypropylene polyethylene fiber) of 130 ml/g by the 50wt%:50wt% ratio by the high absorptivity fiber which has the structure of cross linkage which made the acrylic fiber hydrolyze with high concentration alkali as example 1 base material The nonwoven fabric was used. After cutting off this nonwoven fabric to 70mmx120mm and opening 30g of iron powder, and the mixed powder of 4g of activated carbon to homogeneity on this, it was made to hold to the opening inside a base material by applying an oscillation by vibrator. Then, when 9g of 8% water solutions of a sodium chloride was sprinkled, it was fully held at the nonwoven fabric which is a base material, without escaping from almost in a background.

[0018] Next, by laying TIYYU paper (pulp) \*\* of the shape of a base material and isomorphism on top of both sides of a base material as covering material, and letting a hot calender roll pass, thermocompression bonding was carried out mutually and it considered as the shape of a sheet. Furthermore, one side contained this thing to the flat-like PE liner with which the moisture vapor transmission of 400g/m<sup>2</sup>, the fine porosity film made from the polypropylene of day, and other sides consisted of lamination sheets of a polyethylene film and a nylon nonwoven fabric, and it was used as the sheet-like heating element. It was 3mm as a result of measuring the thickness of this thing. Seal receipt was carried out into the bag outside non-permeability in this condition.

[0019] Two days after, a sheet-like heating element is picked out from an outside bag, and it is JIS in the interior of a room of the room temperature of 20 degrees C, and 65% of relative humidity. Febrile ability was measured based on the exoergic examining method of S-4100. Consequently, the exoergic curve as shown in drawing 3 was obtained. That is, it exceeded 40 degrees C in 15 minutes, and amounted to about 60 degrees C after 70 minutes. And at the time of exoergic continuation of 40 degrees C or more, time amount is about 10 hours and the shape of a sheet flexible during this period always was maintained.

[0020] Instead of mixing high absorptivity fiber as example of comparison 1 base material, the nonwoven fabric which mixed the cotton fiber at 50wt%:50wt% was used for the mel tee, and also the sheet-like heating element was similarly manufactured in the example 1. As a result of

measuring [ in / for this sheet-like heating element / an example 1 ] febrile ability on the same conditions, it was an exoergic curve as shown in drawing 3 . That is, although about 30 minutes was required and it amounted to 55 degrees C after 60 minutes until it amounted to 40 degrees C, the temperature rise beyond it was not seen. And time amount was about 6 hours at the time of exoergic continuation of 40 degrees C or more.

[0021]

[Effect of the Invention] This invention used as the base material of an exoergic constituent the nonwoven fabric which used high absorptivity fiber, and while it had the febrile ability which was [ be / exoergic temperature is high and / the persistence time / long ] excellent with it, the manufacture of the large sheet-like heating element of flexibility of it was attained with the thin shape. therefore, warming of the object for warming, and the affected part -- it can equip, where the part of the arbitration of the body is fitted as a \*\* etc., and effectiveness came to be maintained over the long time.

[0022]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The sectional view of the base material with which the exoergic constituent was held.

[Drawing 2] The sectional view of a sheet-like heating element.

[Drawing 3] Exoergic curvilinear drawing.

[Description of Notations]

1 High Absorptivity Fiber

2 Other Fiber

3 Opening

4 Base Material

5 Exoergic Constituent

6 Structure

7 Covering Material

8 Sheet-like Heating Element

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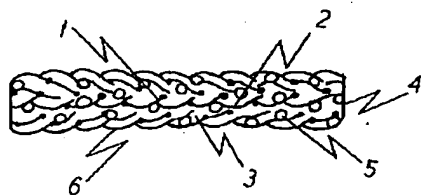
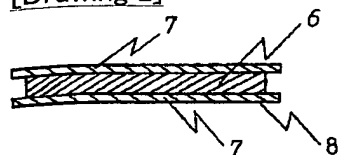
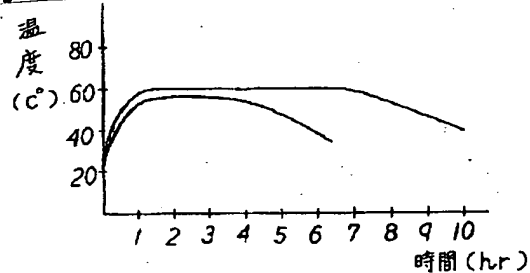
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**DRAWINGS**

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**[Drawing 1]****[Drawing 2]****[Drawing 3]**

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